

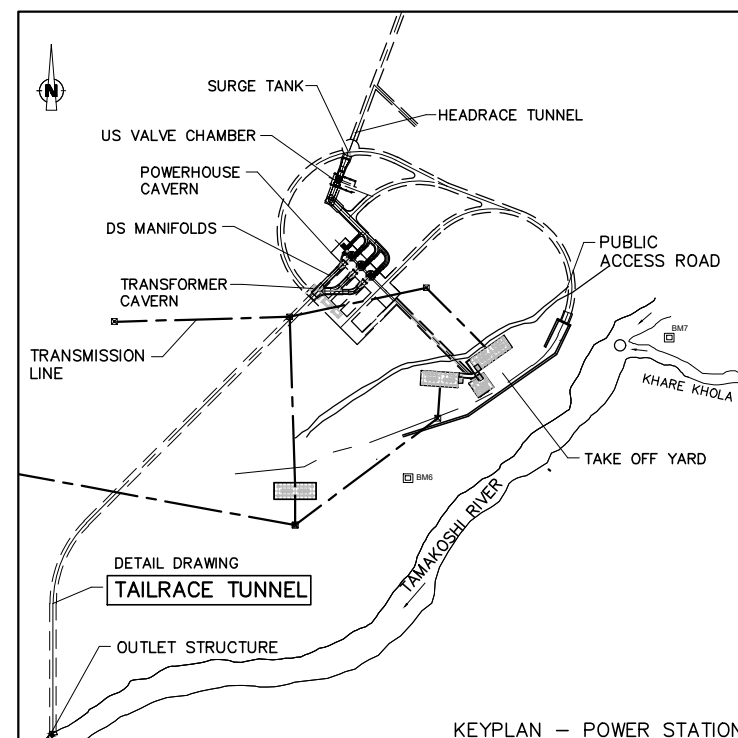
LAYOUT
DOWNSTREAM POWERWATER WAYS
SCALE 1:2000

NOTES:

1. ALL DIMENSIONS ARE IN METERS [m] UNLESS OTHERWISE NOTED.
2. ALL ELEVATIONS ARE ABOVE SEA LEVEL IN [masl].
3. CO-ORDINATES BASED ON NATIONAL GEODETIC NETWORK SYSTEM (EVEREST 1830).

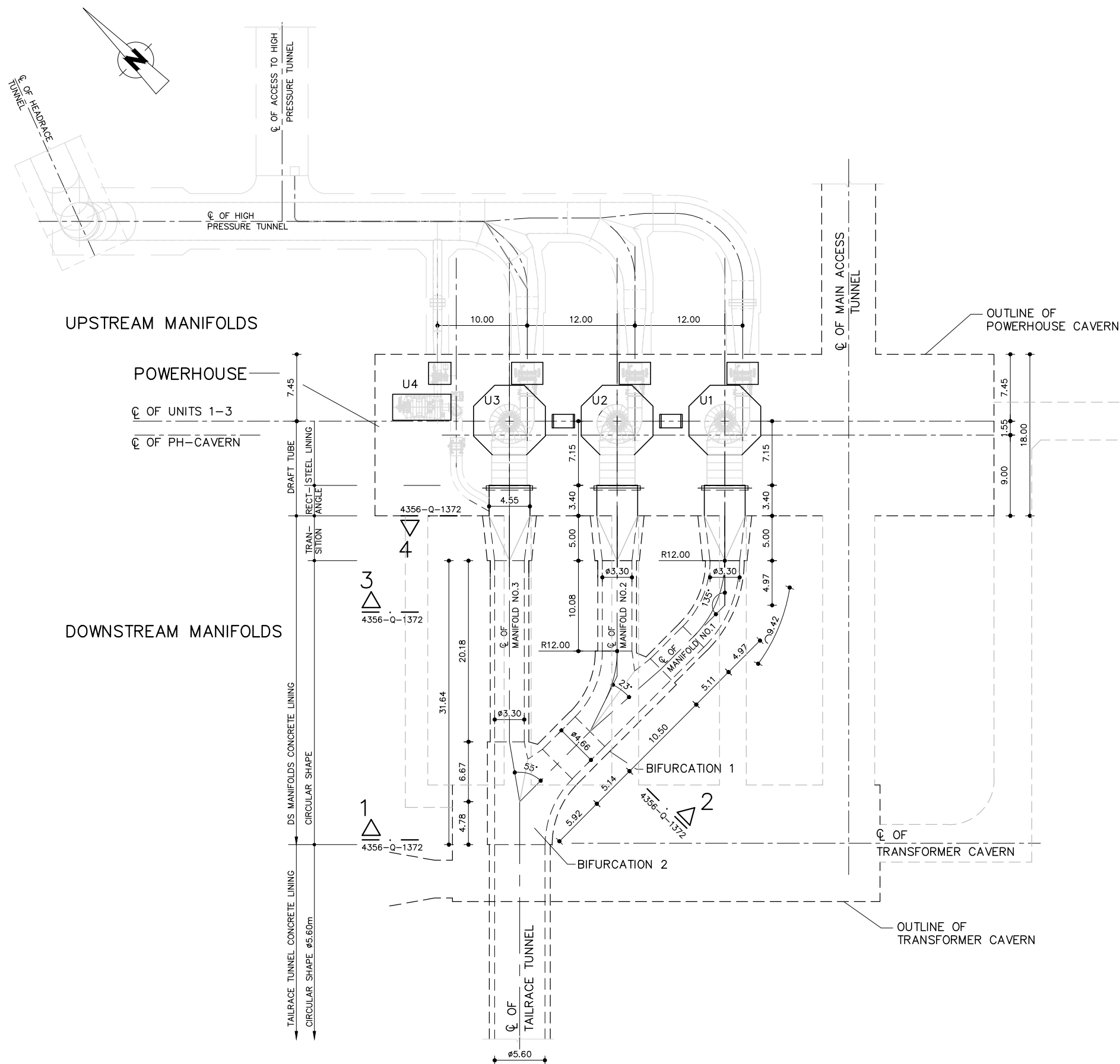
TABLE OF COORDINATES		
CO-ORDINATE POINTS	X-EASTING	Y-NORTHING
TT-1	420667.035	3071484.721
TT-2	420433.148	3071250.872
OS-1	420433.140	3071162.950
OS-2	420433.140	3071122.950

DRAFT STATUS:
30.10.2018



KEYPLAN - POWER STATION

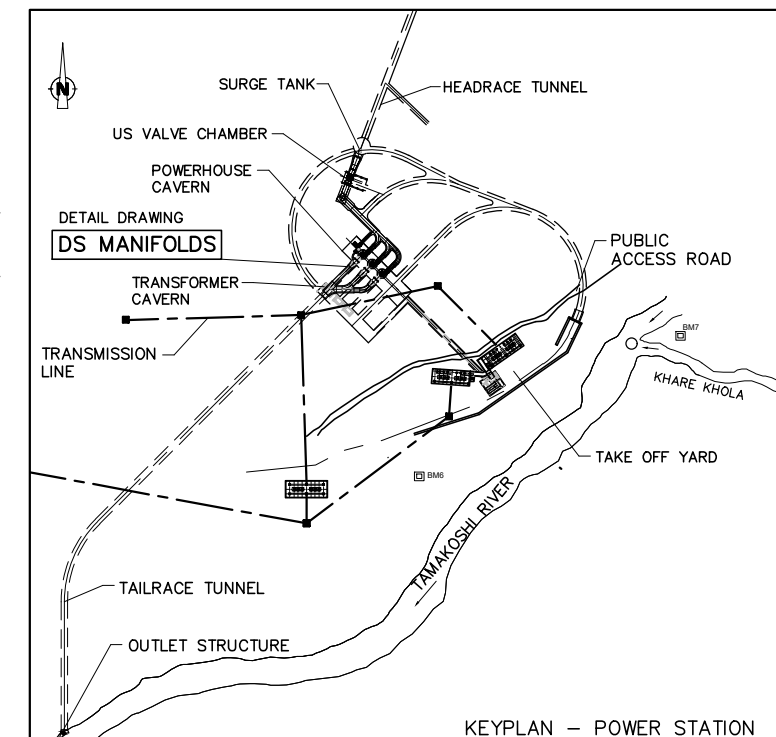
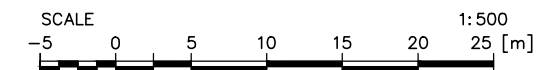
Reference Drawings			
Drwg. No.		Title	
31-00053-DD-4356-1372		DOWNSTREAM POWER WATERWAYS, DOWNSTREAM MANIFOLDS	



NOTES:

1. ALL DIMENSIONS ARE IN METERS [m] UNLESS OTHERWISE NOTED.
2. ALL ELEVATIONS ARE ABOVE SEA LEVEL IN [masl].
3. CO-ORDINATES BASED ON NATIONAL GEODETIC NETWORK SYSTEM (EVEREST 1830).

DRAFT STATUS:
30.10.2018



KEYPLAN - POWER STATION

Reference Drawings

Drwg. No.	Title
31-00053-DD-4356-1372	DOWNSTREAM POWER WATERWAYS, DOWNSTREAM MANIFOLDS

Revisions	Name	Date	Notes



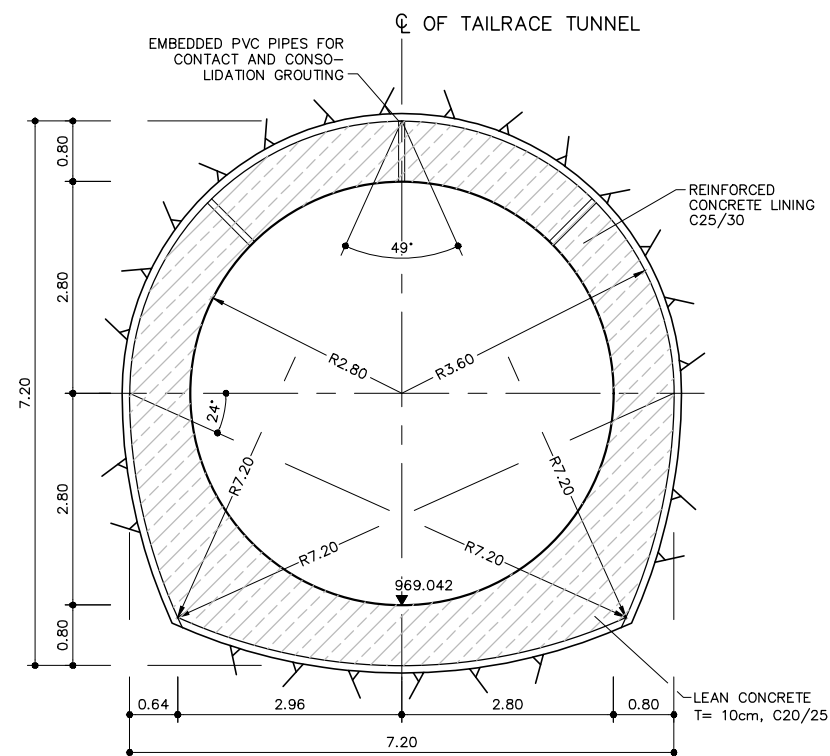
TAMAKOSHI V HYDROELECTRIC PROJECT
PROJECT DEVELOPMENT DEPARTMENT
ENGINEERING SERVICES DIRECTORATE
NEPAL ELECTRICITY AUTHORITY



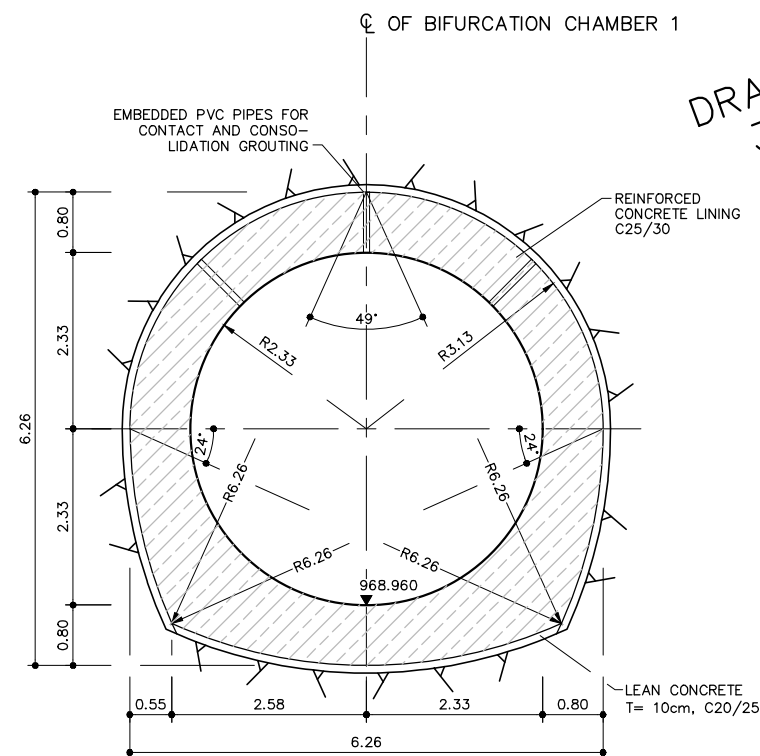
CONSULTING ENGINEERS
BAD VILBEL, GERMANY

TAMAKOSHI V HYDROELECTRIC PROJECT DETAILED ENGINEERING DESIGN

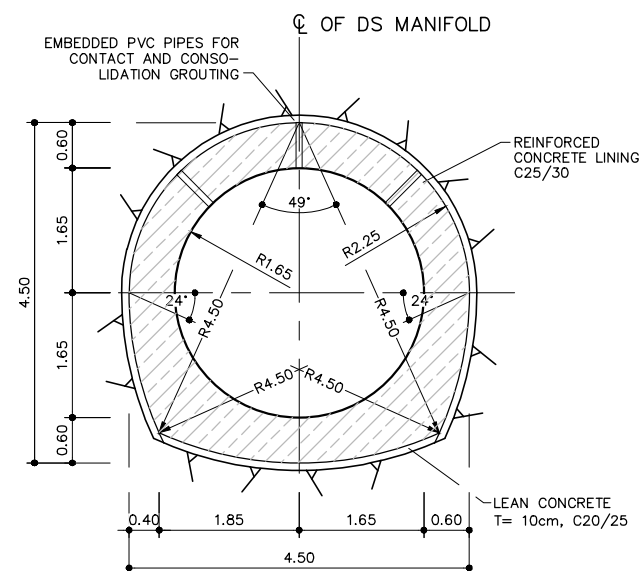
Name	Date	DETAILLED DESIGN
Prepared B. Khadka	23.10.17	DOWNSTREAM POWER WATERWAYS DOWNSTREAM MANIFOLDS LAYOUT
Drawn B. Khadka		
Checked Roloff		
Approved Dr. Moeller		
Replaces Drwg. No:		PROJECT DRAWING
...		
CAD- File No.:		
Scale A3: 1:500		Drwg. No.: 31-00053-DD-4356-Q 1371 REV. -



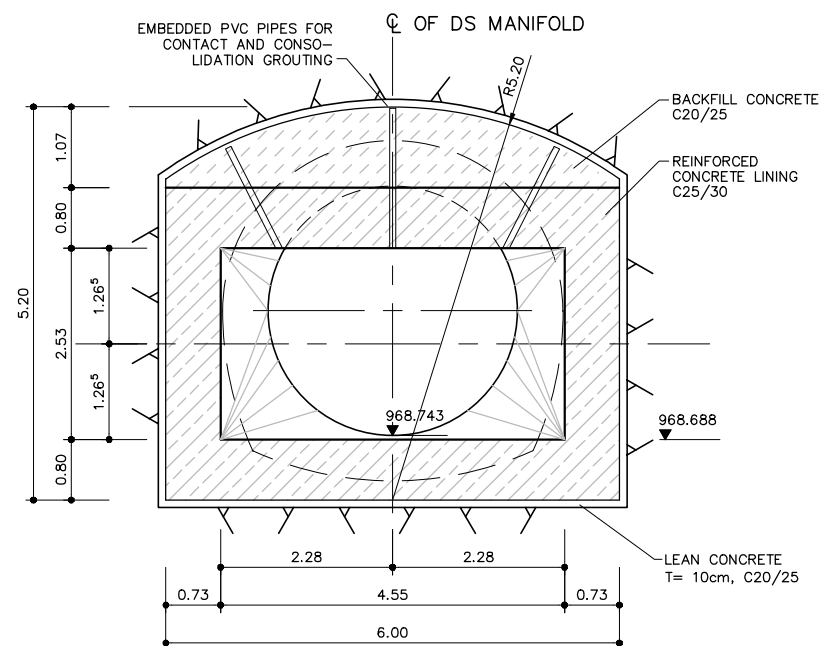
SECTION 1-1
BIFURCATION-CHAMBER 2



SECTION 2-2
BIFURCATION-CHAMBER 1



SECTION 3-3
MANIFOLD TYPICAL SECTION



SECTION 4-4
TRANSITION TYPICAL SECTION

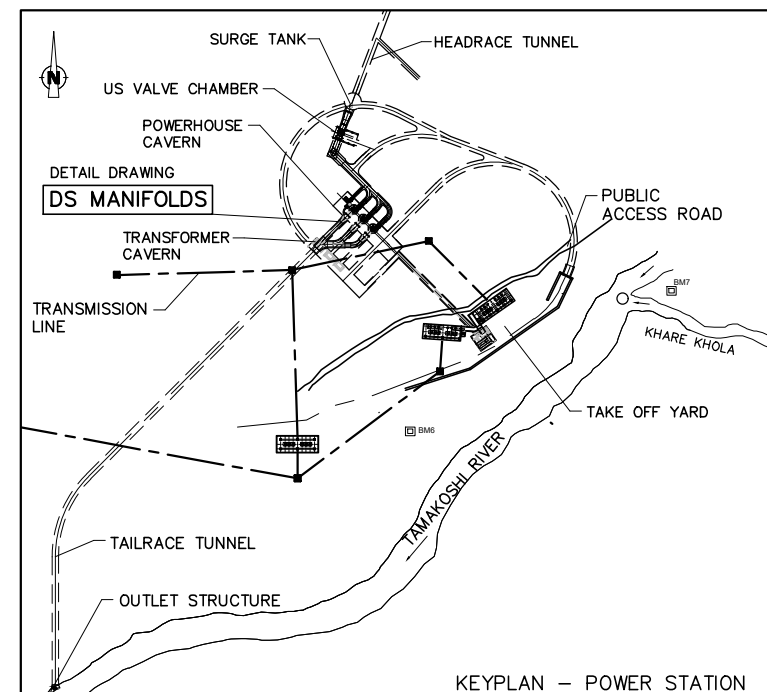
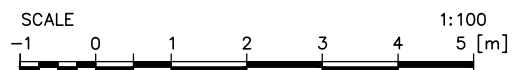
DRAFT STATUS:
30.10.2018

NOTES:

1. ALL DIMENSIONS ARE IN METER [M] UNLESS OTHERWISE NOTED.
2. ALL ELEVATIONS ARE ABOVE SEA LEVEL IN [MASL].
3. CO-ORDINATES BASED ON NATIONAL GEODETIC NETWORK SYSTEM (EVEREST 1830).
4. EXTERNAL DIMENSIONS REFER TO THE SHOTCRETE LINE = THE CLEAR PROFILE OF THE STRUCTURE. THE EXCAVATION LINE HAS TO BE ADJUSTED ACCORDING TO THE ACTUAL GEOLOGICAL CONDITIONS.
5. ROCK SUPPORT MEASURES NOT SHOWN.
6. EMBEDDED PVC PIPES FOR GROUTING PURPOSE ONLY FOR INDICATIVE PURPOSE.

LEGEND:

- CONCRETE CLASS C1 - FIRST STAGE CONCRETE C25/30
- BACKFILL CONCRETE C20/25



Reference Drawings

Drwg. No.	Title
31-00053-DD-4356-1371	DOWNSTREAM POWER WATERWAYS, DOWNSTREAM MANIFOLDS, LAYOUT

Revisions	Name	Date	Notes



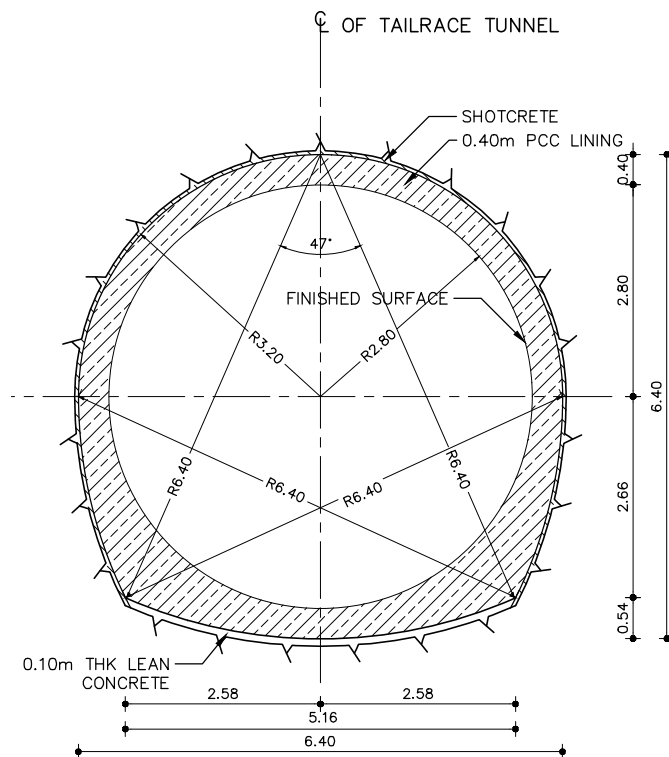
TAMAKOSHI V HYDROELECTRIC PROJECT
PROJECT DEVELOPMENT DEPARTMENT
ENGINEERING SERVICES DIRECTORATE
NEPAL ELECTRICITY AUTHORITY



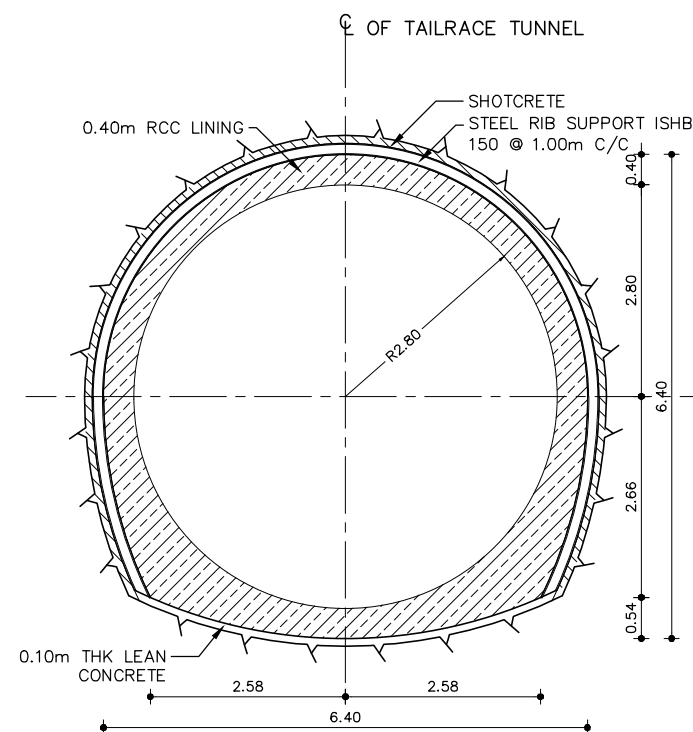
CONSULTING ENGINEERS
BAD VILBEL, GERMANY

TAMAKOSHI V HYDROELECTRIC PROJECT DETAILED ENGINEERING DESIGN

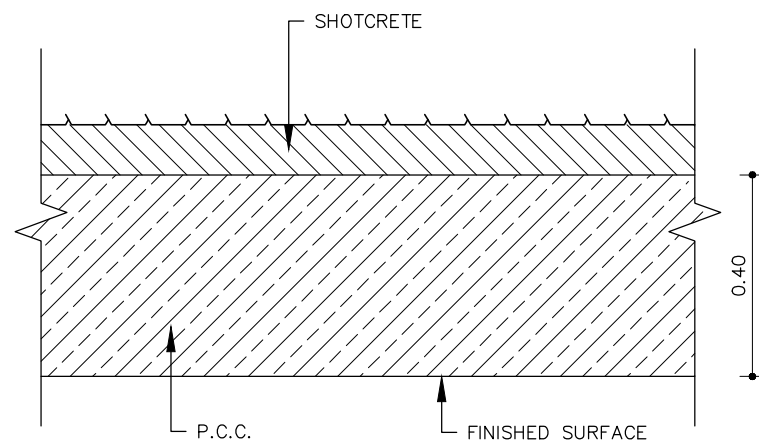
Name	Date	DETAILLED DESIGN
Prepared B. Khadka	23.10.17	DOWNSTREAM POWER
Drawn B. Khadka		WATERWAYS
Checked Roloff		DOWNSTREAM MANIFOLDS
Approved Dr. Moeller		SECTIONS
Replaces Drwg. No:		PROJECT DRAWING
CAD- File No.:		
Scale A3: 1:100		Drwg. No.: 31-00053-DD-4356-Q 1372 REV. -



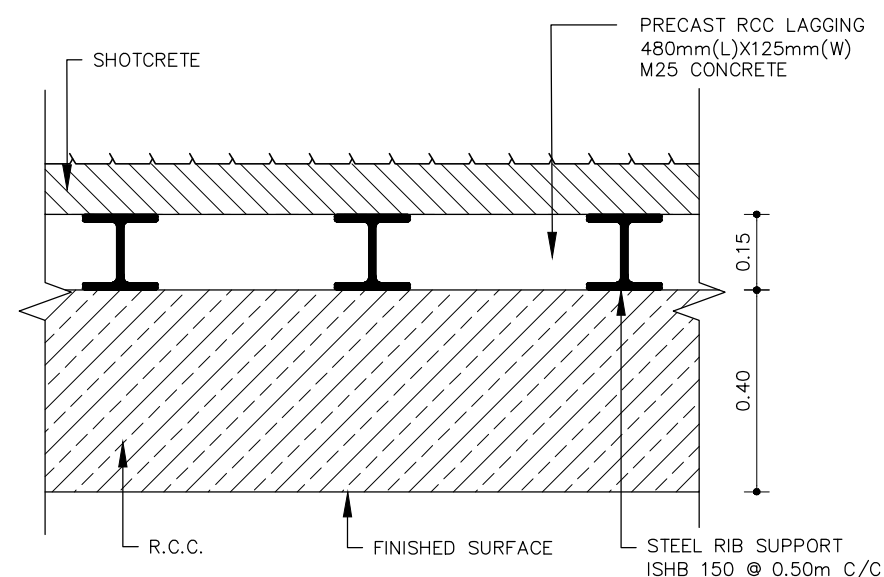
TYPICAL DETAILS OF CONCRETE LINING
FOR ROCK CLASS II, III & IV



TYPICAL DETAILS OF CONCRETE LINING
FOR ROCK CLASS V



LINING DETAILS WITHOUT STEEL RIB SUPPORT
NOT TO SCALE



LINING DETAILS WITH STEEL RIB SUPPORT
NOT TO SCALE

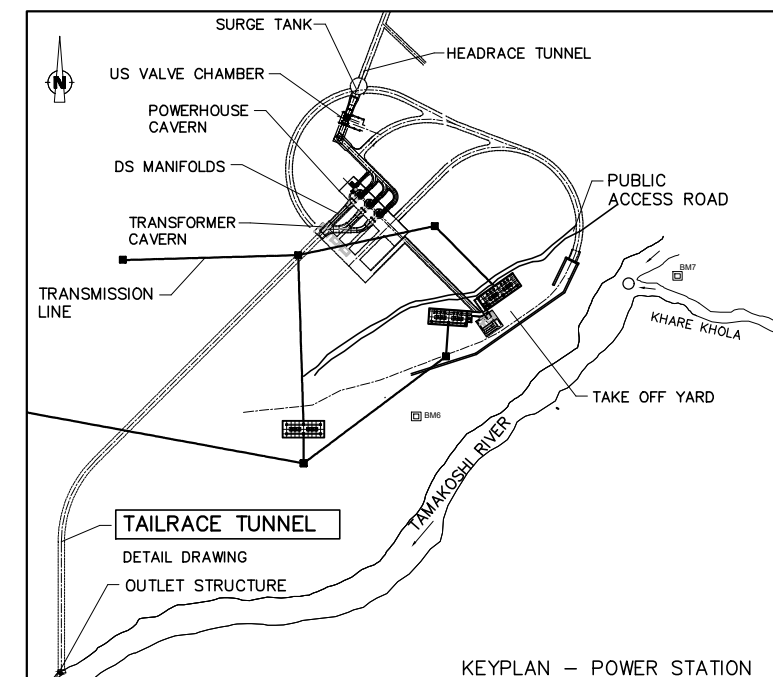
DRAFT STATUS:
27.09.2018

NOTES:

1. ALL DIMENSIONS ARE IN METER [m] UNLESS OTHERWISE NOTED.
2. NO DIMENSION SHALL BE MEASURED FROM THE DRAWING. ONLY WRITTEN DIMENSION SHALL BE FOLLOWED.
3. THIS DRAWING SHOWS ONLY THE DETAILS OF CONCRETE LINING IN TAILRACE TUNNEL.
4. CONCRETE FOR LINING SHALL BE M30 (C25/30) GRADE CONFORMING TO IS: 456-2000.
5. PCC = PLAIN CEMENT CONCRETE, RCC = REINFORCED CEMENT CONCRETE
6. IN OVER EXCAVATED AREAS BACKFILL CONCRETE M15 SHALL BE PLACED OR AS DIRECTED BY ENGINEER.

LEGEND:

- CONCRETE CLASS C1 – CONCRETE C25/30
- CONCRETE CLASS F – BLINDING CONCRETE C12/15



Reference Drawings

Drwg. No.	Title
31-00053-DD-4356-Q-1370	DOWSTREAM POWER WATERWAYS, TAILRACE TUNNEL, LAYOUT

Revisions	Name	Date	Notes



TAMAKOSHI V HYDROELECTRIC PROJECT
PROJECT DEVELOPMENT DEPARTMENT
ENGINEERING SERVICES DIRECTORATE
NEPAL ELECTRICITY AUTHORITY



CONSULTING ENGINEERS
BAD VILBEL, GERMANY

TAMAKOSHI V HYDROELECTRIC PROJECT DETAILED ENGINEERING DESIGN

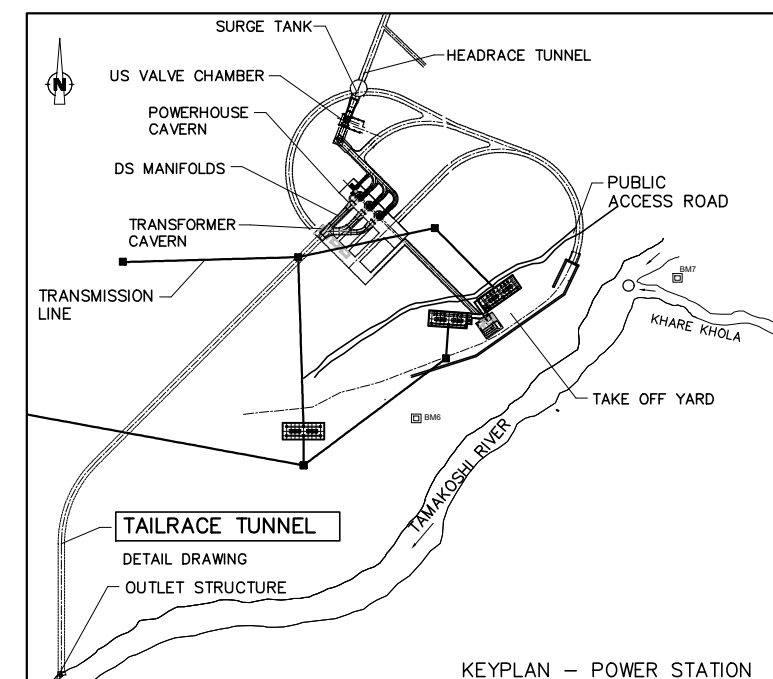
Name	Date	DETAILLED DESIGN
Prepared R. Shrivastava	27.09.18	DOWSTREAM POWER
Drawn A. K. Basu	27.09.18	WATERWAYS
Checked Roloff	27.09.18	TAILRACE TUNNEL
Approved Dr. Moeller	27.09.18	CONCRETE LINING DETAILS
Replaces Drwg. No: 31-00053-DD-4364-Y-0000_		PROJECT DRAWING
CAD- File No.:		
Scale A3: 1:100	Drwg. No.: 31-00053-DD-4356- S 1382	REV. —



1. ROCK BOLTS SHALL HAVE THE FOLLOWING CHARACTERISTICS:
 - DIA. 25 MM
 - YIELD STRENGTH 500 N/MM²
 - MAXIMUM TENSILE CAPACITY 213 KN
2. THE SHOTCRETE MIX SHALL HAVE 28 DAYS OF COMPRESSIVE STRENGTH OF 35MPa.
3. STEEL RIBS SHALL CONFORM TO IS: 226-1975.
4. AN ADDITIONAL LAYER OF 50MM THK PLAIN SHOTCRETE SHALL BE APPLIED ON THE EXPOSED PARTS OF STEEL RIBS FOR PROTECTION AGAINST CORROSION.
5. ROCK SUPPORT MEASURES SHOWN ON THIS DRAWING ARE PRELIMINARY ONLY. FINAL ARRANGEMENT OF ROCK SUPPORT (SHOTCRETE THICKNESSES; LENGTH, ORIENTATION AND GRID OF ROCK BOLTS) HAVE TO BE ADOPTED TO ACTUAL GEOTECHNICAL CONDITIONS, SUBJECT TO AGREEMENT BETWEEN OWNER AND CONTRACTOR.
6. THE APPLICATION OF ROCK SUPPORT CLASSES (RSC) DEPENDS ON THE ACTUALLY ENCOUNTERED CONDITIONS AND GEOTECHNICAL MONITORING AND SHALL BE DECIDED BY THE RESPONSIBLE SECTION ENGINEER/GEOLOGIST.
7. CONTOUR BLASTING HAS TO BE DONE SMOOTHLY WITH MINIMUM DAMAGE TO THE REMAINING ROCKMASS AND AVOIDING OVERBREAKS AS MUCH AS POSSIBLE.
8. BOLT ORIENTATION SHALL BE ADAPTED TO ENCOUNTERED REQUIREMENTS, INSTALLED PERPENDICULAR TO THE ADIT PROFILE, IF DEVIATION FROM VERTICALITY REQUIRED SHALL BE RESTRICTED BELOW 30°.
9. IN AREA WITH LARGE WATER INFLOW (SO THAT FULLY GROUTED-BOLT CANNOT BE PLACED) SWELLEX ANCHORS OF CORRESPONDING ARRANGEMENT COULD BE USED INSTEAD OF TEMPORARY SUPPORT UNTIL THE WATER INFLOW IS REDUCED TO A LEVEL THAT ALLOWS SHOTCRETING AND PLACEMENT BY FULLY GROUTED-BOLTS.
10. DRIPPING OR FLOWING WATER HAS TO BE COLLECTED IN PIPES BEFORE SHOTCRETING SPECIAL DRAIN HOLES MAY BE REQUIRED (USE SWELLEX BOLT).
11. CONDITIONAL FOREPOLING FOR Q-VALUES <0.10, FOREPOLING UMBRELLA SHALL ADOPT AS PER MIN.: ø25 FULLY GROUTED STEEL BARS, 6m EMBEDDED, 2.0m OVERLAP, 300mm SPACING, 10° ANGLE

1. ALL DIMENSIONS ARE IN METER [m] UNLESS OTHERWISE NOTED.
2. ALL ELEVATIONS ARE ABOVE SEA LEVEL IN [masl].
3. EXTERNAL DIMENSIONS REFER TO THE SHOTCRETE LINE = THE CLEAR PROFILE OF THE STRUCTURE. THE EXCAVATION LINE HAS TO BE ADJUSTED ACCORDING TO THE ACTUAL GEOLOGICAL CONDITIONS.
4. ALL SHOTCRETE SHALL BE PLAIN SHOTCRETE WITH WIREMESH IF ASSIGNED IT ACCORDING TO ROCK SUPPORT.

DRAFT STATUS:
15.10.2018



Reference Drawings				
Drwg. No.			Title	
Revisions				
	Name	Date	Notes	



TAMAKOSHI V HYDROELECTRIC PROJECT
PROJECT DEVELOPMENT DEPARTMENT
ENGINEERING SERVICES DIRECTORATE
NEPAL ELECTRICITY AUTHORITY

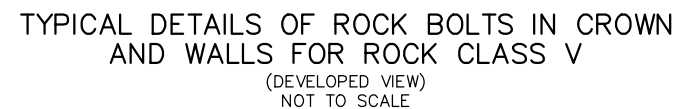


CONSULTING ENGINEERS
BAD VILBEL, GERMANY

TAMAKOSHI V HYDROELECTRIC PROJECT

DETAILED ENGINEERING DESIGN

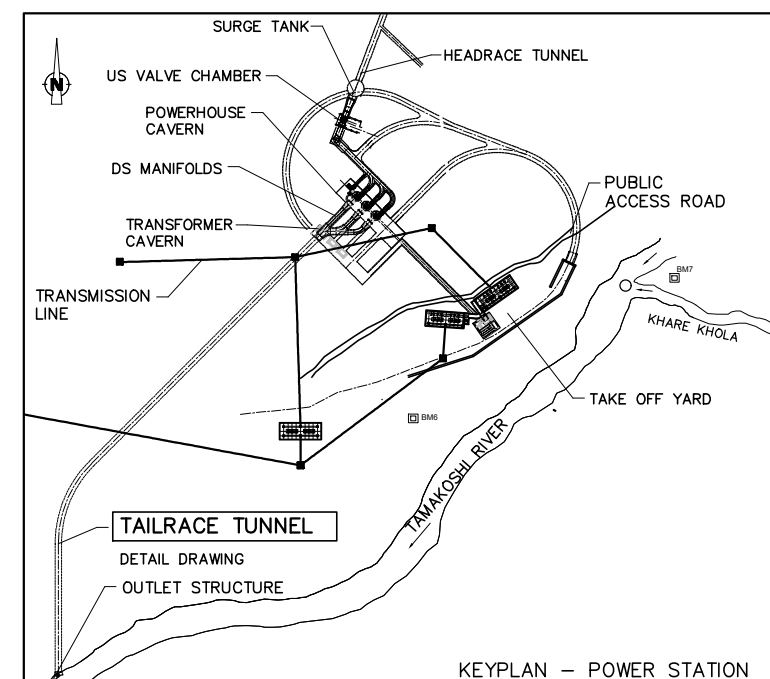
	Name	Date	DETAILED DESIGN	
Prepared	R. Shrivastava	21.09.18	<u>DOWNSTREAM POWER</u> <u>WATERWAYS</u> <u>TAILRACE TUNNEL</u> <u>ROCK SUPPORT SYSTEM</u> SHEET 1 OF 2 PROJECT DRAWING	
Drawn	A. K. Basu	21.09.18		
Checked	Roloff	21.09.18		
Approved	Dr. Moeller	21.09.18		
Replaces Drwg. No:				
CAD- File No.:				
Scale A3: 1:100			Drwg. No.: 31-00053-DD-4356- S 1385	
			REV. -	





DRAFT STATUS:
15.10.2018

1. ROCK BOLTS SHALL HAVE THE FOLLOWING CHARACTERISTICS:
 - DIA. 25 MM
 - YIELD STRENGTH 500 N/MM²
 - MAXIMUM TENSILE CAPACITY 213 KN
2. THE SHOTCRETE MIX SHALL HAVE 28 DAYS OF COMPRESSIVE STRENGTH OF 35MPa.
3. STEEL RIBS SHALL CONFORM TO IS:226-1975.
4. AN ADDITIONAL LAYER OF 50MM THK PLAIN SHOTCRETE SHALL BE APPLIED ON THE EXPOSED PARTS OF STEEL RIBS FOR PROTECTION AGAINST CORROSION.
5. ROCK SUPPORT MEASURES SHOWN ON THIS DRAWING ARE PRELIMINARY ONLY. FINAL ARRANGEMENT OF ROCK SUPPORT (SHOTCRETE THICKNESSES; LENGTH, ORIENTATION AND GRID OF ROCK BOLTS) HAVE TO BE ADOPTED TO ACTUAL GEOTECHNICAL CONDITIONS, SUBJECT TO AGREEMENT BETWEEN OWNER AND CONTRACTOR.
6. THE APPLICATION OF ROCK SUPPORT CLASSES (RSC) DEPENDS ON THE ACTUALLY ENCOUNTERED CONDITIONS AND GEOTECHNICAL MONITORING AND SHALL BE DECIDED BY THE RESPONSIBLE SECTION ENGINEER/GEOLOGIST.
7. CONTOUR BLASTING HAS TO BE DONE SMOOTHLY WITH MINIMUM DAMAGE TO THE REMAINING ROCKMASS AND AVOIDING OVERBREAKS AS MUCH AS POSSIBLE.
8. BOLT ORIENTATION SHALL BE ADAPTED TO ENCOUNTERED REQUIREMENTS, INSTALLED PERPENDICULAR TO THE ADIT PROFILE, IF DEVIATION FROM VERTICALITY REQUIRED SHALL BE RESTRICTED BELOW 30°.
9. IN AREA WITH LARGE WATER INFLOW (SO THAT FULLY GROUTED-BOLT CANNOT BE PLACED) SWELLEX ANCHORS OF CORRESPONDING ARRANGEMENT COULD BE USED INSTEAD OF TEMPORARY SUPPORT UNTIL THE WATER INFLOW IS REDUCED TO A LEVEL THAT ALLOWS SHOTCRETING AND PLACEMENT BY FULLY GROUTED-BOLTS.
10. DRIPPING OR FLOWING WATER HAS TO BE COLLECTED IN PIPES BEFORE SHOTCRETING SPECIAL DRAIN HOLES MAY BE REQUIRED (USE SWELLEX BOLT).
11. CONDITIONAL FOREPOLING FOR Q-VALUES <0.10, FOREPOLING UMBRELLA SHALL ADOPT AS PER MIN.: Ø25 FULLY GROUTED STEEL BARS, 6m EMBEDDED, 2.0m OVERLAP, 300mm SPACING, 10° ANGLE

1. ALL DIMENSIONS ARE IN METER [m] UNLESS OTHERWISE NOTED.
2. ALL ELEVATIONS ARE ABOVE SEA LEVEL IN [masl].
3. EXTERNAL DIMENSIONS REFER TO THE SHOTCRETE LINE = THE CLEAR PROFILE OF THE STRUCTURE. THE EXCAVATION LINE HAS TO BE ADJUSTED ACCORDING TO THE ACTUAL GEOLOGICAL CONDITIONS.
4. ALL SHOTCRETE SHALL BE PLAIN SHOTCRETE WITH WIREMESH IF ASSIGNED IT ACCORDING TO ROCK SUPPORT.



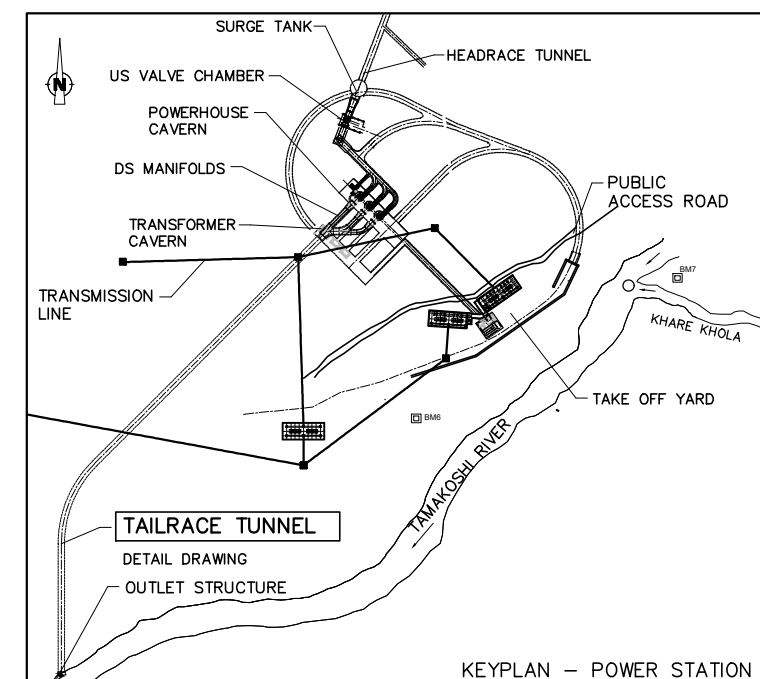
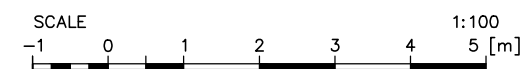
Reference Drawings			
Drwg. No.		Title	
Revisions			
Name		Notes	
 <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> TAMAKOSHI V HYDROELECTRIC PROJECT PROJECT DEVELOPMENT DEPARTMENT ENGINEERING SERVICES DIRECTORATE NEPAL ELECTRICITY AUTHORITY </div>			
 LAHMEYER INTERNATIONAL		CONSULTING ENGINEERS BAD VILBEL, GERMANY	
TAMAKOSHI V HYDROELECTRIC PROJECT DETAILED ENGINEERING DESIGN			
	Name	Date	DETAILED DESIGN <u>DOWNSTREAM POWER</u> <u>WATERWAYS</u> <u>TAILRACE TUNNEL</u> ROCK SUPPORT SYSTEM SHEET 2 OF 2 PROJECT DRAWING
Prepared	R. Shrivastava	21.09.18	
Drawn	A. K. Basu	21.09.18	
Checked	Roloff	21.09.18	
Approved	Dr. Moeller	21.09.18	
Replaces Drwg. No:			
CAD- File No.:			
Scale A3: 1:100			Drwg. No.: 31-00053-DD-4356- S 1385
			REV. 1



DRAFT STATUS:
27.09.2018

1. ALL DIMENSIONS ARE IN METER [m] UNLESS OTHERWISE NOTED.
2. NO DIMENSION SHALL BE MEASURED FROM THE DRAWING. ONLY WRITTEN DIMENSION SHALL BE FOLLOWED.
3. THIS DRAWING REFERS ONLY GROUTING DETAILS IN TAILRACE TUNNEL.
4. CONCRETE FOR LINING SHALL BE M30 (C25/30) GRADE CONFORMING TO IS: 456-2000.
5. GROUT PRESSURE FOR CONTACT GROUTING WILL BE ABOUT 2.5KG/CM².
6. GROUT PRESSURE FOR CONSOLIDATION GROUTING WILL BE ABOUT 5.0KG/CM².

 CONCRETE CLASS C1 – CONCRETE C25/30



Reference Drawings					
Drwg. No.				Title	
Revisions					
	Name	Date	Notes		



TAMAKOSHI V HYDROELECTRIC PROJECT
PROJECT DEVELOPMENT DEPARTMENT
ENGINEERING SERVICES DIRECTORATE
NEPAL ELECTRICITY AUTHORITY



CONSULTING ENGINEERS
BAD VILBEL, GERMANY

TAMAKOSHI V HYDROELECTRIC PROJECT

DETAILED ENGINEERING DESIGN

	Name	Date	DETAILED DESIGN <u>DOWNSTREAM POWER</u> <u>WATERWAYS</u> <u>TAILRACE TUNNEL</u> <u>GROUTING DETAILS</u> PROJECT DRAWING		
Prepared	R. Shrivastava	27.09.18			
Drawn	A. K. Basu	27.09.18			
Checked	Roloff	27.09.18			
Approved	Dr. Moeller	27.09.18			
Replaces Drwg. No: 31-00053-DD-4364-Y-0000- <u> </u>					
CAD- File No.:					
Scale A3: 1:100			Drwg. No.: 31-00053-DD-4356-S 1387	REV.	